#INspirEDmath

October 2018, Volume 4

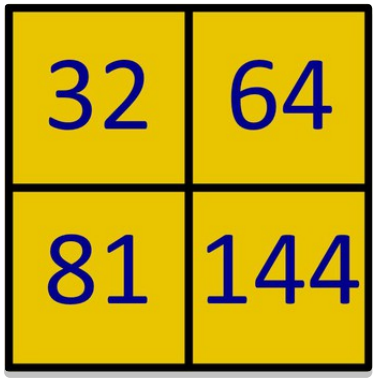
High Quality Learning

This month we dig into the learner experience. Soon to be forgotten are the days of the worksheet with 25 problems addressing the same skill or concept. Although easy to find and a breeze to give, practice makes more than perfect, it makes permanent. The student who practices 25 problems incorrectly solidifies their misunderstandings. Not only that, but these low level assignments don't promote reasoning and problem solving, can be quite boring, and become the reason students fall out of love with math. Instead, we should replace those worksheets with high quality tasks that promote productive struggle, conceptual understanding, problem solving and reasoning skills, and excellent mathematical discourse. According to NCTM's publication, *Principles to Action*, "effective mathematics teaching uses tasks as one way to motivate student learning and help students build new mathematical knowledge through problem solving." Tasks can range from routine to complex, they place higher cognitive demand on the student and they allow for exploration and creativity in student approach.

Later in this newsletter we outline six ways to modify your current assignments. For example, turn your question about finding area in to an inquiry task. This can be done by simply asking a different question:
Original question - What is the area of a rectangle with side lengths of 4 and 12?
Updated question - How many different rectangles can you create with an area of 48?

Read on for more inspiration!

Practical Ways to Develop Students' Mathematical Reasoning



Problem of the Month!

Post this image and ask, "Which one doesn't belong?" Give students time to think independently before sharing out.

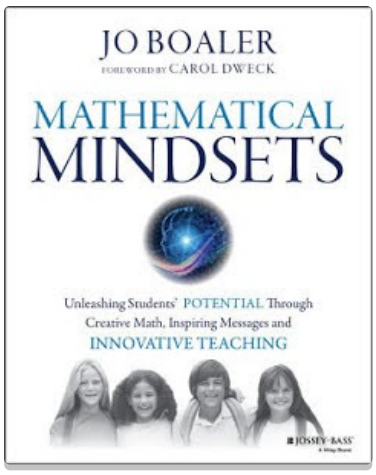
The *Which One Doesn't Belong* website provides thought-provoking puzzles involving numbers, shapes, and graphs for math teachers and students from kindergarten to calculus. There are no answers provided as there are many different, correct ways of choosing which one doesn't belong!

My favorite part? The incomplete sets where students fill in one or two of the boxes based on their own mathematical reasoning!

You can even make up your own, depending on your learning goals!

October's Focus: Practice #2

1. Establishing mathematics goals to focus learning
2. **Implement tasks that promote reasoning and problem solving**
3. Use and connect mathematical representations
4. Facilitate meaningful discourse
5. Pose purposeful questions
6. Build procedural fluency from conceptual understanding
7. Support productive struggle in learning mathematics
8. Elicit and use evidence of student thinking



Designing Rich Mathematical Tasks

In Jo Boaler's book, *Mathematical Mindsets*, you will find six alterations you can make to tasks to increase their richness and to ensure students have the opportunity to reason, grapple, and problem solve. We have summarized them below.

1. Open tasks to encourage multiple methods, pathway, and representations
2. Make it an inquiry task
3. Ask the problem before teaching the method
4. Add a visual component
5. Low floor - high ceiling
6. Add requirement to convince and reason

Mathematical Tasks at Four Levels of Cognitive Demand

Lower-level demands (memorization): • reproducing previously learned facts, rules, formulas, definitions or committing them to memory • Cannot be solved with a procedure • Have no connection to concepts or meaning that underlie the facts rules, formulas, or definitions	**Lower-level demands (procedures without connections):** • are algorithmic • require limited cognitive demand • have no connection to the concepts or meaning that underlie the procedure • focus on producing correct answers instead of understanding • require no explanations
Higher-level demands (procedures with connections): • use procedure for deeper understanding of concepts • broad procedures connected to ideas instead narrow algorithms • usually represented in different ways • require some degree of cognitive effort; procedures may be used but not mindlessly	**Higher-level demands (doing mathematics):** • require complex non-algorithmic thinking • require students to explore and understand the mathematics • demand self-monitoring of one's cognitive process • require considerable cognitive effort and may involve some level of anxiety b/c solution path isn't clear

Leinwand, S., D. Brahier, and D. Huinker . *Principles to Action. Reston, VA*: National Council of Teachers of Mathematics, 2014 (pg 18)

Let's get started!

Click on one of the buttons below to explore websites that provide mathematically rich tasks that incorporate one or more of the strategies discussed above.

Robert Kaplinsky

"Math resources that create problem solvers, not robots."

youcubed.org

Youcubed is a small group of people working to get as many free and inspiring math ideas out to teachers and learners as possible.

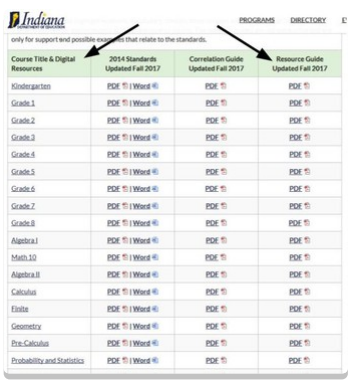
balancedassessment.concord.org

Help students become proficient in demonstrating their mathematical knowledge through developing their critical thinking and mathematical actions!

numberstrings.com

The creators envision this site as a place where teachers, coaches and mathematics educators can find new strings, post strings, get feedback on design or number choice, and discuss the pedagogy of number strings.

An update on our resources


Indiana

PROGRAMS DIRECTORY

only for support and possible examples that relate to the standards.

Course Title & Digital Resources	2014 Standards Updated Fall 2017	Correlation Guide Updated Fall 2017	Resource Guide Updated Fall 2017
Kindergarten	PDF | Word	PDF	PDF
Grade 1	PDF | Word	PDF	PDF
Grade 2	PDF | Word	PDF	PDF
Grade 3	PDF | Word	PDF	PDF
Grade 4	PDF | Word	PDF	PDF
Grade 5	PDF | Word	PDF	PDF
Grade 6	PDF | Word	PDF	PDF
Grade 7	PDF | Word	PDF	PDF
Grade 8	PDF | Word	PDF	PDF
Algebra I	PDF | Word	PDF	PDF
Math 10	PDF | Word	PDF	PDF
Algebra II	PDF | Word	PDF	PDF
Calculus	PDF | Word	PDF	PDF
Finite	PDF | Word	PDF	PDF
Geometry	PDF | Word	PDF	PDF
Pre-Calculus	PDF | Word	PDF	PDF
Probability and Statistics	PDF | Word	PDF	PDF

We continue to update our resource pages to align with our message of high leverage practices to promote deep learning. Here is what we have accomplished so far:

- Hyperlinked each course title - This will take you to our digital resources such as lesson ideas and tasks. As we continue to add resources we are mindful of our message. Lessons and tasks added promote reasoning and problem solving as outlined above.

- Updated resource guides - The field has spoken and we have heard you! You want this information. We have added our first few DRAFT resource guides and are working feverishly to make more available to you. Check back often!

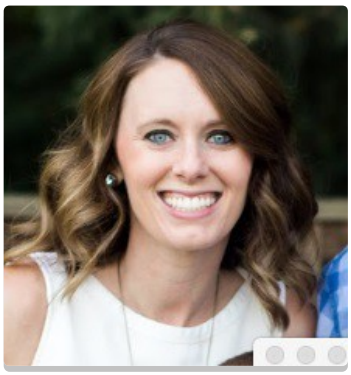
Feel free to provide feedback on the new resource documents. If you think we missed an "I can" statement, or maybe we missed an opportunity to vertically articulate, use this link (or the one on our standards page) to add your thoughts.

2018 ICTM Fall Conference

November 4 and 5, at the Marriott East in Indianapolis
Registration is still open!
"Find Your Way: Mathematics as a GPS"
Explore topics such as:

- Student engagement in meaningful learning
- Access, equity, and empowerment
- Becoming a more effective instructional coach
- Using the new state assessments to increase student learning

Spotlight - Caitlin Zahn



"My name is Caitlin Zahn, and I am excited and honored to be part of this month's spotlight! I am currently in the middle of my ninth year of teaching. My career started at the Lynhurst 7th & 8th Grade Center in Wayne Township where I spent a year teaching 7th grade math. I have spent the rest of my career at Noblesville High School where I have taught Geometry, Algebra II, and Precalculus. I also serve as the Algebra II PLC (Professional Learning Community) leader.
My favorite part of teaching is building relationships with my students. I love getting to know them and figuring out what works best for each new group of students each year. Seeing my students enjoy the process of learning math is more rewarding to me than a letter grade on any exam. I am always up for trying new things, as long as I believe it will benefit my students. Trial and error is all part of the fun! I am always looking for new ways to connect with and learn from all of the experience and knowledge that Hoosier math teachers possess. Let's connect via Twitter @MrsZahn1228!"

Your IDOE Mathematics Team

Dr. Jennifer Jensen

@DrJenJensen

Assistant Director of Curriculum and Instruction

Indiana Department of Education
jjensen@doe.in.us
(317) 232-6673
doe.in.gov

Robin Conti

@RobinLConti

Secondary Mathematics Specialist

Indiana Department of Education
rconti@doe.in.gov
(317)-233-6098
doe.in.gov

Beau Scott

@NerdCoreTeacher

Elementary Mathematics Specialist

Indiana Department of Educati...
jscott3@doe.in.us
(317)-232-9142
doe.in.gov